

Braun Intertec Corporation 11001 hampshire Averue S Minreapolis MN 55438 Phone: 952,995,2000 Fax: 952,995,2020 Web: prayathrenec.com

December 7, 2004

Project BL-03-01531

Mr. J. Michael Orange City Planner Minneapolis Planning Department Room 210 City Hall Minneapolis, MN 55415-1385

Dear Mr. Orange:

Re: Description of Geology of the Site; Proposed A-Mill Developments; Main Street Southeast and Third Avenue Southeast; Minneapolis, Minnesota

The purpose of this letter is to generally describe the geology of the site and to address the characteristics of the soils and bedrock that may or may not promote or enhance groundwater infiltration.

The soil profile at the site is highly variable. The general soil profile at the site consisted of 2 to 22 feet of typical urban fill underlain by native granular soils. The granular soils are generally considered to be permeable and will generally allow water to flow through them. Occasional glacial till clay layers were encountered at depth in multiple locations across the site. These soils are generally considered to be impermeable and will tend to retain water atop the layers, which would result in areas of perched water.

Below the fill and native granular soils, soil borings conducted by Braun Intertec Corporation encountered the Platteville limestone. Based on typical bedrock formations within the Minneapolis metropolitan area and University of Minnesota tunnel profiles at the Southeast Stream Plant, the bottom of the limestone in this area will tend to be at about elevation 764. With the top of bedrock at the site being about 802, the limestone cap in the area is about 38 feet thick, suggesting portions of the Magnolia Member and the full thickness of the Hidden Falls Member, the Mifflin Member and the Pecatonica Member are in place. A 2 to 3 feet layer of shale is present immediately below the limestone and above the sandstone. The thickness of the sandstone ranges from slightly less than 100 feet to slightly less than 200 feet.

The overburden soils are easily excavated for installation of items such as footings, basements and tunnels. Large diameter tunneling using boring machines, for instance, is generally not done in the overburden. The Platteville limestone is very hard and difficult to remove. Shallow surface removals can potentially be done with conventional equipment however the deeper the penetration, the greater the need for removal techniques such as blasting. Vertical drilling into the limestone is common place whereas most types of horizontal tunneling through the limestone, particularly using large diameters, is difficult and is generally not done. To the best of our knowledge, there are currently no extensive publicly controlled tunnels in the Platteville Limestone formation.

The shale layer has the characteristics of very compact, over-consolidated, dry clay. Left undisturbed, it will act as an impermeable layer. If exposed, it will absorb water and swell. The absorption of moisture and the swelling generally exerts very high pressure on anything that is attempting to control the swelling.

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The sandstone layer immediately below the shale is easily excavated and exhibits very good self-supporting characteristics. As a result, many of the tunnels that the City of Minneapolis and the University of Minnesota have installed are located in the sandstone, immediately below the shale zone or deeper. These tunnels are used as storm sewers, sanitary sewers and to distribute steam, chilled water and power. Review of the Southeast Steam Plant site plans provided by the University of Minnesota indicate they recognized the benefits of sandstone tunneling and have taken advantage of them. The provided maps show their tunnels exit the steam plant near the northeast corner of the building and then turn downstream toward the Main Plant and the Minneapolis campus. These maps also indicate the tunnels are located east of 6th Avenue Southeast, several blocks away from the A-Mill site.

There could be four different zones where water could potentially be encountered. The upper two zones would be within the overburden soils or atop the limestone. Water encountered in either of these zones would be considered to be "perched" and not representative of the area groundwater surface. The next lower zone would be found within the limestone layers itself, where a stable water level could potentially be encountered within weathered zones, fractured zones or naturally occurring voids. The amount of water in this zone is generally influenced by the natural vertical and horizontal fractures found throughout the limestone and is generally retained in the limestone by the shale layer at depth. The location to natural outfalls will also affect the level and volume of water in the limestone. Natural outfalls include naturally eroded channels in the limestone, which allow for exit area for the water.

The lowest water table, and most likely the area water table, is generally found within the sandstone. In this area, the water level will be controlled by the water level in the Mississippi River. As noted in other reports, groundwater was not encountered in the borings at the time of our evaluation and we would expect the area groundwater levels are likely well below the depth of our borings, in the sandstone. However, perched water conditions may be encountered if deep excavations are made into the bedrock. The area groundwater levels should be expected to fluctuate both seasonally and annually and likely in direct response to the nearby Mississippi River.

Footings for the proposed buildings at the A-Mill site are currently designed to be supported on the sound limestone bedrock that is expected to be close to the current limestone surface. It is predicted that excavations of less than 2 feet will be needed to expose the sound bedrock. At this depth, encountering water-bearing zones within the bedrock would be very unusual and is currently not expected.

Conclusions

Since the building foundations and footings will be located above the expected groundwater elevations, groundwater levels and naturally occurring flow patterns within the bedrock should not be impacted during or after construction.

Given the bedrock profile in the area and the location of the University of Minnesota steam plant and other tunnels in the area, the proposed construction should not have any impact on their integrity or use.

When completed, most of the site will be covered with buildings and impervious surfaces and the storm water runoff will be captured by storm water catch basins connected to the storm sewer. The collected water would then be diverted to outlet structures and ultimately to the river. The relatively small amounts of water infiltrating from the surface (e.g., from green areas) will likely be absorbed within the soil matrix. If the infiltration is sufficient to "saturate the soil column," some may reach the surface of the underlying limestone, where it may enter the natural fractures within the limestone layers and eventually find its way to a water table located in the limestone, if one exists.

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In conclusion, since the building foundations and footings will not encounter groundwater and water infiltration from the surface is expected to be minimal, it is our opinion that no design or construction mitigation measures to limit water infiltration would be needed.

If you have any questions regarding this letter, please call Dan Holte at (952) 995-2460 or Michael Heuer at (952) 995-2258.

DANIEL R. HOLTE

42083

Sincerely,

BRAUN INTERTEC CORPORATION

Professional Certification:

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Geologist under the laws of the State of Minnesota.

Daniel R. Holte, PG

Senior Consultant

License Number: 42083

December 7, 2004

Michael M. Heuer, PE

Vice President - Principal Engineer